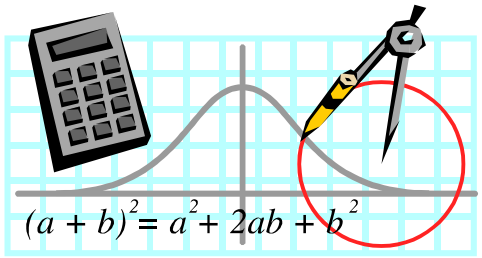
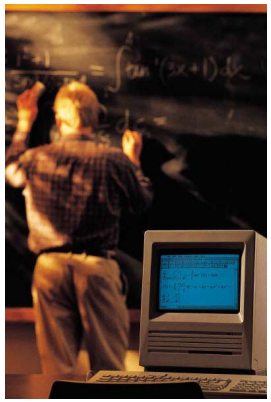
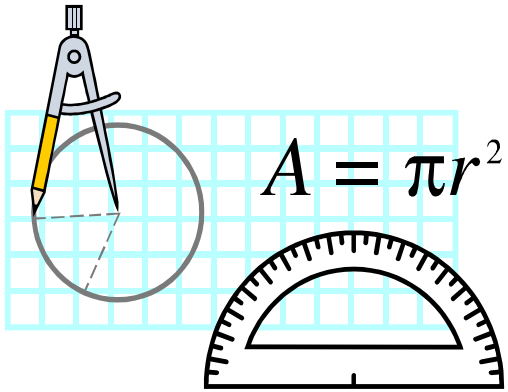
Gateway Skills
Mathematics-Intensive Occupations







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Key Findings

- According to 2000 estimates, there were 50,890 mathematics-intensive jobs in Missouri earning an annual mean wage of $53,193 per job, which is much higher than the state average wage of $30,812 per job.

- Nationally, there were 2.94 million mathematics-intensive jobs earning an annual mean wage of $58,886 per job. Missouri employs 1.73% of this national total at 90.3% of the national mean annual wage, indicating lower labor costs for mathematics-intensive jobs.

- In Missouri, most mathematics-intensive jobs were in Services (21,060 jobs earning $55,898 per job), Manufacturing (12,180 jobs earning $53,194 per job), Finance, Insurance and Real Estate (4,810 jobs earning $50,659 per job), Public Administration (4,760 jobs earning $44,735 per job) and Transport and Public Utilities (4,650 jobs earning $57,044 per job).

- In Missouri, mathematics-intensive occupations with the highest employment base were Accountants and Auditors (17,320 jobs at $44,390 per job), Computer Software Engineers (5,950 jobs at $65,182 per job), Computer Systems Engineers (3,700 jobs at $64,743 per job), Aerospace Engineers (3,330 jobs at $56,220 per job) and Civil Engineers (3,140 jobs at $55,866 per job).

- Occupations with the largest percentage of national employment in Missouri were Agricultural Engineers (5.07% of national employment at 97.04% of national mean wages), Aerospace Engineers (4.65% of national employment at 81.43% of national mean wages) and Higher Education Engineering Teachers (3.64% of national employment at 100.62% of national mean wages). These occupations can be considered target occupations, since Missouri has a fair share of national employment and state wage rates are at or below the national mean annual wage - indicating lower labor costs, a possible competitive advantage.

- As expected, Mathematics is the most important knowledge domain needed for mathematics-intensive occupations. Other relevant knowledge domains include Engineering and Technology and Computers and Electronics.

- Missouri institutions of higher education are producing fewer college graduates in many of these fields of study than they did 20 years ago. The number of graduates obtaining any post secondary degree (bachelors, masters or doctorate) in mathematics and engineering has declined over the past 20 years.

- More worrisome, however, is that only 8.28% of Missouri's 10th graders were proficient or advanced in mathematics. This indicates that Missouri's K-12 student population is ill prepared for post secondary study in mathematics-related subjects, and ill prepared to enter the workforce immediately after high school into occupations that require mathematics skills.

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Gateway Skills
Mathematics-Intensive Occupations

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Analysis and reporting by
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I. Overview

As we move into the 21st century, the connection between well paying jobs and skills has never been more apparent. In today's economy, workers with marketable skills are able to be more competitive in the labor market. *Gateway Skills* are those abilities that allow workers to find employment in occupations characterized by job security, advancement opportunities and high wages. In a changing economic and political landscape, informed decision making requires that labor, industry and government consider occupational requirements in a new manner. Using a skill-based perspective provides a tangible way to make well reasoned judgements linking workforce skills to targeted occupations.

The quality of the workforce matters now more than ever. Well trained workers who can produce high quality goods and services at lower costs helps to enhance productivity and competitiveness in state and national economies - which generally leads to higher living standards. In today's globalized economy, workers must be prepared to change the way they perform their jobs in order to capture the benefits from rapidly evolving technology. Education and training are core components in higher productivity, quality and flexibility for the economy. The economy of the 21st century will see the continued decline of high-paying production jobs requiring few skills. The workplace has been reorganized, and more and more jobs now require communication, mathematics, reading and science skills. In essence, the 21st century economy will be dominated by *knowledge workers*.

The terms knowledge work and knowledge worker are only 40 years old. The terms were first coined around 1960 by a Princeton economist, named Fritz Machlup. Knowledge workers are the new capitalists. Knowledge has become the key resource, and the only scarce one. This means that knowledge workers collectively own the means of production through their specialized education and skills. As a group, they are also capitalists in the old sense. Through their stakes in pension funds and mutual funds, they have become majority shareholders and owners of many large businesses in the knowledge economy. Although knowledge workers are highly specialized, they cannot function effectively as individuals. Knowledge workers need access to an organization - a collective that brings together an array of knowledge workers and applies their specializations to a common end-product. Therefore, it is essential that policy makers and economic development officials recruit organizations that employ these skilled knowledge workers.

Although these terms are widely used, there is a dearth of research informing what constitutes a knowledge worker and their presence in the economy. Mathematics is one of the key knowledge bases in today's economy. Therefore, this analysis focuses on those occupations that require a high degree of knowledge in mathematics - a targeted Gateway Skill.

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II. Methods

Mathematics skills refer to the developed capacities that facilitate learning and/or performance within occupations. Occupations were classified as mathematics-intensive if both the importance and level of mathematics skills needed to perform a particular job were two or more standard deviations above the mean mathematics skill level for all occupations. Using data taken from O*NET, importance and level skills were summed and divided by the maximum value. This generated a mathematics skill proficiency score that ranged from 0.0 (low skill proficiency) to 100.0 (high skill proficiency).

$$\text{SKILL-PROFICIENCY}_{\text{occupation}i} = ((IM+LV) / MAX)$$

Where:
IM = Skill Importance Score
LV = Skill Level Score
MAX = Sum of Maximum Values on IM and LV

The data for this analysis comes from two principle sources. Information on occupational skill requirements was taken from a national database called the Occupational Information Network (O*NET), maintained by the U.S. Department of Labor. Occupational employment and wage data for Missouri was taken from Occupational Employment Statistics (OES), maintained by the Missouri Department of Economic Development and the U.S. Department of Labor.

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*Occupational Information Network (O*NET)*

O*NET is a comprehensive database of worker attributes and job characteristics. The database contains information on knowledge, skill and ability requirements for 1,122 occupations. Although it is sometimes difficult to differentiate among knowledge, skill and ability in practice, they are distinct concepts in theory. Knowledge refers to information that has been acquired though formal education, training or specific experiences. Skills refer to developed capacities that facilitate learning or performance. Abilities are defined as underlying characteristics of individuals, which are related to effective or superior performance in a job.

The knowledge and skills measures are used in this analysis. It is important to remember that knowledge and skills in this study do not measure an individual worker's knowledge and skills. Instead, the knowledge and skills are measures of the average level required by the performance of certain functions in that occupation. Consequently, the score for one worker on any knowledge or skill may differ from another worker within the same occupation.

Occupational Employment Statistics (OES)

The Occupational Employment Statistics (OES) program conducts a yearly mail survey designed to produce estimates of employment and wages for specific occupations. The OES program collects data on wage and salary workers in non-farm establishments in order to produce employment and wage estimates for over 700 occupations. Data from self-employed persons are not collected and are not included in the estimates. The OES program produces these occupational estimates by geographic area and by industry. Estimates based on geographic areas are available at the national, state and metropolitan area levels. Occupational employment and wage estimates for over 400 industry classifications are also available.

The Missouri Department of Economic Development conducts the OES survey for the State of Missouri. Each year more than 10,000 employers will be surveyed through random selection based on their industrial classification, size and geographic location. In addition to the statewide data, there are tabulations for each of the state's six metropolitan statistical areas and thirteen Local Workforce Investment Areas.

III. Mathematics-Intensive Occupations Summary

According to 2000 estimates, there were 50,890 mathematics-intensive jobs in Missouri earning an annual mean wage of $53,193 per job, which is much higher than the state average wage of $30,812 per job. On average in Missouri, entry-level wages were $40,747 per job and experienced-level wages were $63,490 per job. In addition, workers in mathematics-intensive occupations accounted for 1.89% of all employment and 3.27% of all wages earned statewide.

Most mathematics-intensive jobs were in Services (21,060 jobs earning $55,898 per job), Manufacturing (12,180 jobs earning $53,194 per job), Finance, Insurance and Real Estate (4,810 jobs earning $50,659 per job), Public Administration (4,760 jobs earning $44,735 per job) and Transport and Public Utilities (4,650 jobs earning $57,044 per job).

Nationally, there were 2.94 million mathematics-intensive jobs earning an annual mean wage of $58,886 per job. Missouri employs 1.73% of this national total at 90.3% of the national mean annual wage, indicating lower labor costs for mathematics-intensive jobs.

Mathematics-Intensive Occupations - Employment and Wages by Industry in Missouri

Estimated annual average employment and wages for 2000. Numbers may not total due to rounding and survey averages.

INDUSTRY	AVERAGE EMPLOYMENT	ENTRY WAGE	MEAN WAGE	EXPERT WAGE
Agriculture, Forestry and Fishing	10	$20,316	$32,738	$50,810
Mining	100	$33,860	$43,432	$51,689
Construction	1,480	$39,199	$47,439	$53,708
Manufacturing	12,180	$42,609	$53,194	$62,974
Transportation and Public Utilities	4,650	$47,760	$57,044	$66,361
Wholesale Trade	1,330	$36,874	$47,783	$58,051
Retail Trade	470	$30,445	$39,482	$47,131
Finance, Insurance, and Real Estate	4,810	$35,849	$50,659	$60,130
Services	21,060	$41,765	$55,898	$66,654
Public Administration	4,760	$35,607	$44,735	$53,643
MISSOURI TOTAL	**50,890**	**$40,747**	**$53,193**	**$63,490**
UNITED STATES TOTAL	**2,943,380**	**$43,927**	**$58,886**	**$70,728**

Source: Analysis of Occupational Employment Statistics by MERIC, MO Department of Economic Development.

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In Missouri, mathematics-intensive occupations with the highest employment base were Accountants and Auditors (17,320 jobs at $44,390 per job), Computer Software Engineers (5,950 jobs at $65,182 per job), Computer Systems Engineers (3,700 jobs at $64,743 per job), Aerospace Engineers (3,330 jobs at $56,220 per job) and Civil Engineers (3,140 jobs at $55,866 per job).

Occupations with the largest percentage of national employment in Missouri were Agricultural Engineers (5.07% of national employment at 97.04% of national mean wages), Aerospace Engineers (4.65% of national employment at 81.43% of national mean wages) and Higher Education Engineering Teachers (3.64% of national employment at 100.62% of national mean wages). These occupations can be considered target occupations, since Missouri has a fair share of national employment and state wage rates are at or below the national mean annual wage - indicating lower labor costs, a possible competitive advantage.

In the United States, mathematics-intensive occupations with the highest employment base were Accountants and Auditors (863,320 jobs at $48,090 per job), Computer Software Engineers (374,640 jobs at $70,300 per job), Computer Systems Engineers (264,610 jobs at $70,890 per job), Mechanical Engineers (207,300 jobs at $60,860 per job) and Civil Engineers (207,080 jobs at $58,380 per job).

Between 2000 and 2010, the fastest growing occupation in the United States will be Computer Software Engineers (100.0% growth with 41,000 annual openings), Computer Systems Engineers (89.7% growth with 31,000 annual openings), Hydrologists (25.7% growth with less than 1,000 annual openings), Financial Analysts (25.5% growth with 6,000 annual openings), Computer Hardware Engineers (24.9% growth with 2,000 annual openings), Higher Education Teachers (23.5% growth with 68,000 annual openings) and Environmental and Health Scientists (22.3% growth with 4,000 annual openings).

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Mathematics-Intensive Occupations - Employment and Wages in Missouri and the United States

Estimated annual average employment and wages for 2000. Entry wages represent the 25th percentile and expert wages represent the 75th percentile.

OCCUPATION	MISSOURI				UNITED STATES			
	AVERAGE EMPL	ENTRY WAGE	MEAN WAGE	EXPERT WAGE	AVERAGE EMPL	ENTRY WAGE	MEAN WAGE	EXPERT WAGE
Accountants and Auditors	17,320	$31,600	$44,390	$52,196	863,320	$34,290	$48,090	$56,190
Computer Software Engineers	5,950	$54,788	$65,182	$76,453	374,640	$53,390	$70,300	$85,490
Computer Systems Engineers	3,700	$50,863	$64,743	$77,387	264,610	$54,460	$70,890	$86,520
Mechanical Engineers	3,070	$44,185	$55,829	$66,852	207,300	$47,600	$60,860	$72,850
Civil Engineers	3,140	$45,026	$55,866	$66,527	207,080	$45,150	$58,380	$69,470
Electrical Engineers	2,790	$47,913	$58,979	$70,737	162,400	$51,700	$66,320	$80,600
Financial Analysts	2,480	$34,416	$51,167	$59,502	159,490	$40,210	$59,760	$70,840
Electronics Engineers	1,430	$47,496	$58,222	$68,897	123,690	$52,430	$66,490	$79,960
Aerospace Engineers	3,330	$45,449	$56,220	$66,402	71,550	$56,410	$69,040	$82,570
Mechanical Drafters	980	$29,609	$36,615	$43,620	69,620	$30,010	$40,330	$48,250
Computer Hardware Engineers	850	$45,826	$61,129	$74,186	63,680	$52,960	$70,100	$86,280
Operations Research Analysts	690	$34,306	$50,844	$65,837	59,820	$40,530	$57,700	$70,790
Environmental and Health Scientists	730	$31,597	$37,865	$41,951	54,860	$34,570	$48,090	$58,490
Surveyors	530	$28,547	$40,530	$50,173	52,750	$26,480	$39,060	$49,030
Mathematical Science Teachers, High Educ	980	$33,947	$44,450	$54,036	37,660	$35,520	$51,410	$64,500
Engineering Teachers, Higher Educ	980	$49,334	$67,957	$85,710	26,940	$48,420	$67,540	$85,040
Geoscientists	160	$32,523	$41,562	$49,330	21,810	$43,320	$62,420	$77,180
Aerospace Engineering Technicians	340	$38,677	$45,315	$52,550	19,850	$40,220	$49,920	$57,320
Statisticians	330	$35,772	$46,381	$56,915	17,520	$37,160	$54,630	$69,220
Economists	390	$42,525	$85,186	$145,606	13,680	$47,370	$69,800	$87,890
Actuaries	210	$54,555	$80,045	$104,563	12,890	$47,260	$72,470	$93,140
Nuclear Engineers	170	$61,099	$69,029	$80,823	12,610	$67,590	$78,770	$89,310
Petroleum Engineers	10	$48,603	$57,565	$71,985	10,250	$60,610	$79,910	$100,210
Physicists	80	$64,051	$78,247	$92,535	8,990	$65,820	$82,990	$102,270
Hydrologists	50	$43,267	$57,058	$68,580	7,240	$43,740	$57,490	$68,500
Mining and Geological Engineers	60	$38,181	$47,819	$55,715	6,690	$47,320	$64,390	$78,720
Marine Engineers and Architects	20	$51,288	$62,537	$79,811	4,680	$46,430	$61,500	$76,620
Mathematicians	10	$58,977	$62,259	$75,465	3,140	$50,740	$67,770	$85,520
Agricultural Engineers	110	$46,065	$57,098	$67,277	2,170	$44,220	$58,840	$71,460
Mathematical Technicians	0	$0	$0	$0	1,540	$27,950	$41,800	$45,150
Astronomers	0	$0	$0	$0	910	$48,610	$73,580	$95,970

Source: Analysis of Occupational Employment Statistics by MERIC, MO Department of Economic Development.

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Mathematics-Intensive Occupations - Missouri Percent of National Employment and Wages

Estimated annual average employment and wages for 2000.

OCCUPATION	MO AVG EMPL	US AVG EMPL	MO PCT OF US AVG EMPL	MO MEAN WAGE	US MEAN WAGE	MO PCT OF US MEAN WAGE
Accountants and Auditors	17,320	863,320	2.01	$44,390	$48,090	92.31
Computer Software Engineers	5,950	374,640	1.59	$65,182	$70,300	92.72
Computer Systems Engineers	3,700	264,610	1.40	$64,743	$70,890	91.33
Mechanical Engineers	3,070	207,300	1.48	$55,829	$60,860	91.73
Civil Engineers	3,140	207,080	1.52	$55,866	$58,380	95.69
Electrical Engineers	2,790	162,400	1.72	$58,979	$66,320	88.93
Financial Analysts	2,480	159,490	1.55	$51,167	$59,760	85.62
Electronics Engineers	1,430	123,690	1.16	$58,222	$66,490	87.57
Aerospace Engineers	3,330	71,550	4.65	$56,220	$69,040	81.43
Mechanical Drafters	980	69,620	1.41	$36,615	$40,330	90.79
Computer Hardware Engineers	850	63,680	1.33	$61,129	$70,100	87.20
Operations Research Analysts	690	59,820	1.15	$50,844	$57,700	88.12
Environmental and Health Scientists	730	54,860	1.33	$37,865	$48,090	78.74
Surveyors	530	52,750	1.00	$40,530	$39,060	103.76
Mathematical Science Teachers, High Educ	980	37,660	2.60	$44,450	$51,410	86.46
Engineering Teachers, Higher Educ	980	26,940	3.64	$67,957	$67,540	100.62
Geoscientists	160	21,810	0.73	$41,562	$62,420	66.58
Aerospace Engineering Technicians	340	19,850	1.71	$45,315	$49,920	90.78
Statisticians	330	17,520	1.88	$46,381	$54,630	84.90
Economists	390	13,680	2.85	$85,186	$69,800	122.04
Actuaries	210	12,890	1.63	$80,045	$72,470	110.45
Nuclear Engineers	170	12,610	1.35	$69,029	$78,770	87.63
Petroleum Engineers	10	10,250	0.10	$57,565	$79,910	72.04
Physicists	80	8,990	0.89	$78,247	$82,990	94.28
Hydrologists	50	7,240	0.69	$57,058	$57,490	99.25
Mining and Geological Engineers	60	6,690	0.90	$47,819	$64,390	74.26
Marine Engineers and Architects	20	4,680	0.43	$62,537	$61,500	101.69
Mathematicians	10	3,140	0.32	$62,259	$67,770	91.87
Agricultural Engineers	110	2,170	5.07	$57,098	$58,840	97.04
Mathematical Technicians	0	1,540	0.00	$0	$41,800	0.00
Astronomers	0	910	0.00	$0	$73,580	0.00

Source: Analysis of Occupational Employment Statistics by MERIC, MO Department of Economic Development.

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Mathematics-Intensive Occupations - National Employment Projections 2000-2010

Estimated annual average employment and wages for 2000 and 2010.

OCCUPATION	EMPL PCT CHG 2000-2010	ANNUAL GROWTH	ANNUAL REPLACEMENTS	ANNUAL TOTAL OPENINGS	EDUCATION AND TRAINING REQUIREMENTS
Accountants and Auditors	18.5	18,000	15,000	33,000	Bachelors degree
Computer Software Engineers	100.0	38,000	3,000	41,000	Bachelors degree
Computer Systems Engineers	89.7	28,000	3,000	31,000	Bachelors degree
Mechanical Engineers	13.1	3,000	6,000	9,000	Bachelors degree
Civil Engineers	10.2	2,000	4,000	6,000	Bachelors degree
Electrical Engineers	11.3	2,000	3,000	5,000	Bachelors degree
Financial Analysts	25.5	4,000	2,000	6,000	Bachelors degree
Electronics Engineers	10.4	1,000	3,000	4,000	Bachelors degree
Aerospace Engineers	13.9	1,000	1,000	2,000	Bachelors degree
Mechanical Drafters	15.4	1,000	2,000	3,000	Postsecondary vocational award
Computer Hardware Engineers	24.9	2,000	1,000	2,000	Bachelors degree
Operations Research Analysts	8.0	Less than 1,000	2,000	2,000	Masters degree
Environmental and Health Scientists	22.3	1,000	3,000	4,000	Bachelors degree
Surveyors	8.1	1,000	2,000	2,000	Bachelors degree
Mathematical Science Teachers, High Educ	23.5	32,000	37,000	68,000	Doctors degree
Engineering Teachers, Higher Educ	23.5	32,000	37,000	68,000	Doctors degree
Geoscientists	18.1	1,000	1,000	1,000	Bachelors degree
Aerospace Engineering Technicians	5.6	Less than 1,000	Less than 1,000	Less than 1,000	Associates degree
Statisticians	2.3	Less than 1,000	Less than 1,000	Less than 1,000	Masters degree
Economists	18.5	Less than 1,000	1,000	1,000	Bachelors degree
Actuaries	5.4	Less than 1,000	Less than 1,000	Less than 1,000	Bachelors degree plus work experience
Nuclear Engineers	1.8	Less than 1,000	Less than 1,000	Less than 1,000	Bachelors degree
Petroleum Engineers	-7.2	Less than 1,000	Less than 1,000	Less than 1,000	Bachelors degree
Physicists and Astronomers	10.5	Less than 1,000	Less than 1,000	Less than 1,000	Doctors degree
Hydrologists	25.7	Less than 1,000	Less than 1,000	Less than 1,000	Bachelors degree
Mining and Geological Engineers	-1.3	Less than 1,000	Less than 1,000	Less than 1,000	Bachelors degree
Marine Engineers and Architects	2.1	Less than 1,000	Less than 1,000	Less than 1,000	Bachelors degree
Mathematicians	-1.9	Less than 1,000	Less than 1,000	Less than 1,000	Masters degree
Agricultural Engineers	14.8	Less than 1,000	Less than 1,000	Less than 1,000	Bachelors degree
Misc Mathematical Science Occupations	2.7	Less than 1,000	Less than 1,000	Less than 1,000	Masters degree

Source: Bureau of Labor Statistics, U.S. Department of Labor.

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Using data taken from O*NET, skills and knowledge domain scores were calculated by summing the importance and level skills scores for an occupation and divided by the maximum value. This generated a skill and knowledge domain proficiency score that ranged from 0.0 (low proficiency level) to 100.0 (high proficiency level).

Skills refer to the developed capacities that facilitate learning and/or performance within occupations. Occupations with the highest mathematics skill proficiency were Mathematicians (2.8500 standard deviations above the mean), Aerospace Engineers (2.7654 standard deviations above the mean), Higher Education Mathematical Science Teachers (2.7654 standard deviations above the mean), Statisticians (2.7654 standard deviations above the mean), Physicists (2.6809 standard deviations above the mean), Agricultural Engineers (2.5167 standard deviations above the mean) and Astronomers (2.5167 standard deviations above the mean).

Knowledge domains refer to information that has been acquired through formal education, training or specific experiences. As expected, Mathematics (score of 0.82) is the most important knowledge domain needed for mathematics-intensive occupations. Other relevant knowledge domains include Engineering and Technology (score of 0.61) and Computers and Electronics (score of 0.60).

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Mathematics-Intensive Occupations - Skills Proficiency

Skills reported in standard deviations above the mean for all occupations.
Scores of 0.0 indicate mean skill level for all occupations.

OCCUPATION	LISTENING SKILLS	MATHEMATICS SKILLS	READING SKILLS	SCIENCE SKILLS	SPEAKING SKILLS	WRITING SKILLS
Accountants and Auditors	1.3499	2.1012	1.3448	-0.9144	1.1870	1.3007
Computer Software Engineers	1.1553	2.1833	1.1485	2.2375	1.1870	0.7056
Computer Systems Engineers	1.1553	2.1833	1.1485	2.2375	1.1870	0.7056
Mechanical Engineers	0.2317	2.4122	1.1532	2.0387	0.3754	0.7056
Civil Engineers	0.9068	2.0042	1.1532	1.7463	1.1621	1.3238
Electrical Engineers	1.0006	2.3027	1.5272	2.1362	0.9965	1.3238
Financial Analysts	0.5270	2.0142	1.8497	-0.8812	0.8392	0.8444
Electronics Engineers	0.7193	2.1037	1.5272	2.0582	0.8309	1.4921
Aerospace Engineers	1.3100	2.7654	1.7703	2.7599	0.9799	1.8958
Mechanical Drafters	0.8130	2.0042	0.3117	1.0446	0.4168	0.5668
Computer Hardware Engineers	1.1553	2.1833	1.1485	2.2375	1.1870	0.7056
Operations Research Analysts	1.3100	2.2679	1.3822	1.7853	0.9799	1.3322
Environmental and Health Scientists	-0.3309	2.0142	1.5365	2.2375	-0.1918	0.7014
Surveyors	0.7615	2.3475	1.4617	2.2375	0.5659	1.6855
Mathematical Science Teachers, High Educ	1.0756	2.7654	1.6207	0.8068	1.3236	1.3322
Engineering Teachers, Higher Educ	1.3100	2.3475	1.7703	2.3038	1.4644	1.4037
Geoscientists	0.1379	2.1833	1.2280	2.2375	0.4955	1.5467
Aerospace Engineering Technicians	-0.3122	2.1037	0.6857	2.6040	-0.4112	0.2303
Statisticians	0.8412	2.7654	1.4617	1.9763	0.7729	1.3322
Economists	1.3897	2.0142	1.6160	1.0680	1.6010	1.8958
Actuaries	0.0582	2.3525	1.3074	0.1596	0.3589	0.9832
Nuclear Engineers	1.0006	2.2032	1.5272	2.6819	0.9965	1.5762
Petroleum Engineers	1.0006	2.2032	1.1532	2.0582	1.0793	1.5762
Physicists	0.6865	2.6809	1.9292	2.8886	1.0503	2.1734
Hydrologists	-0.2512	2.2629	1.1485	2.4324	0.0815	1.6855
Mining and Geological Engineers	1.1928	2.3475	1.5786	2.4987	1.1166	1.7234
Marine Engineers and Architects	1.1553	2.0788	1.5178	1.9120	1.1166	1.0357
Mathematicians	0.2176	2.8500	0.9147	0.5495	0.2222	0.7729
Agricultural Engineers	1.3100	2.5167	1.4617	2.6936	1.4644	1.4037
Mathematical Technicians	1.3850	2.2629	1.1485	1.5241	0.8392	0.7056
Astronomers	-0.7201	2.5167	1.3869	2.6936	-0.1256	0.9874

Source: Analysis of O*NET by MERIC, MO Department of Economic Development.

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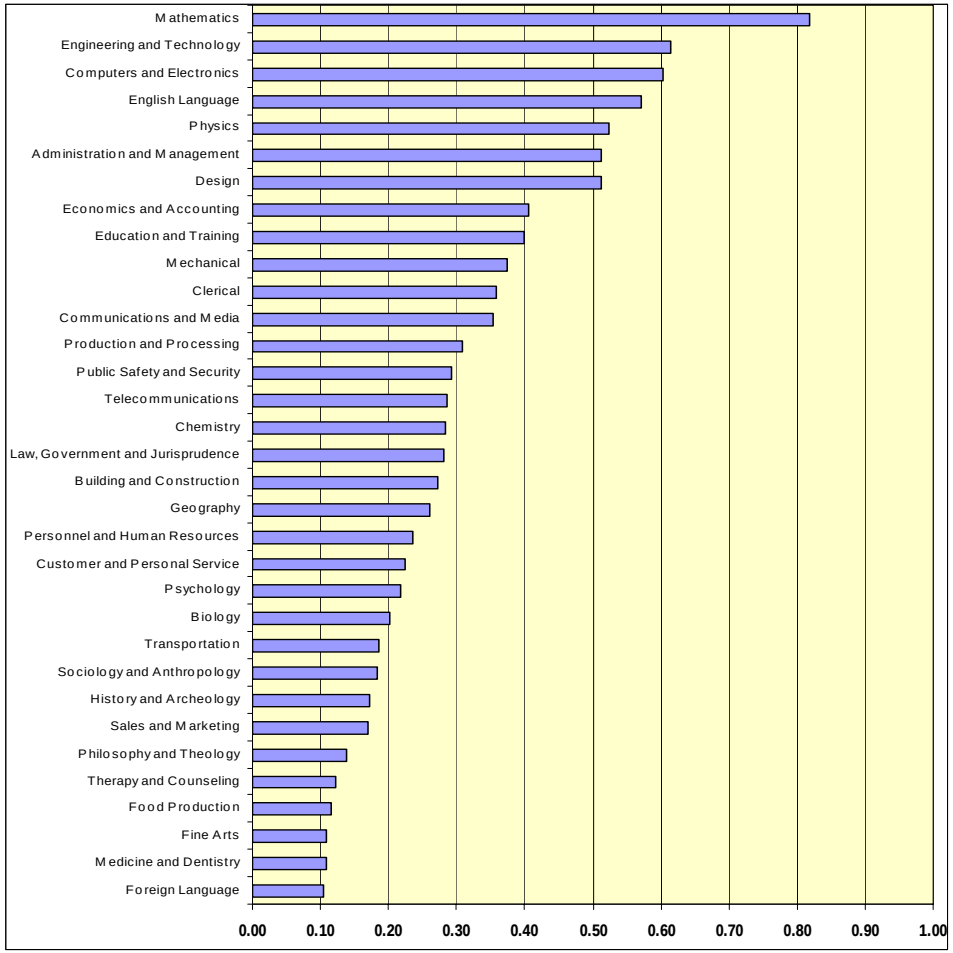
Mathematics-Intensive Occupations - Knowledge Domain Proficiency

Skills proficiency reported on a 0.0 (low) to 1.0 (high) scale.



Source: Analysis of O*NET by MERIC, MO Department of Economic Development.

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In FY 2000, a total of 281 post secondary degrees in mathematics were conferred in Missouri, of which 79.3% were bachelors degrees, 14.3% were masters degrees and 6.4% were doctoral degrees. Although the number of bachelors degrees in mathematics has increased since FY 1981, mathematics degrees as a percent of all bachelors degrees has decreased over the same period. This indicates that proportionately fewer graduates are obtaining bachelors degrees in mathematics in Missouri.

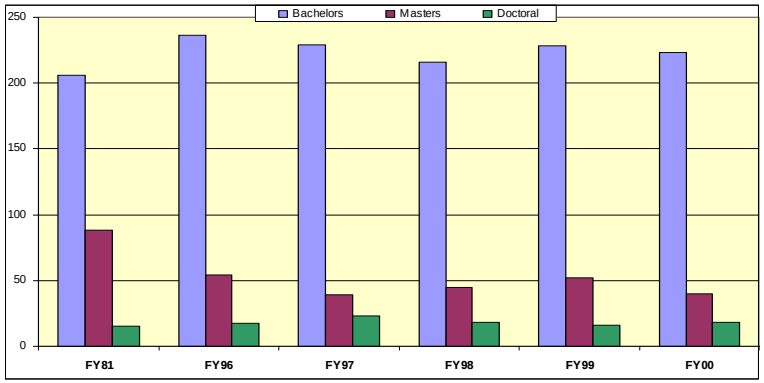
Since FY 1981, the number of masters degrees in mathematics has decreased, as has mathematics degrees as a percent of all masters degrees. In general, the number and percent of doctoral degrees in mathematics has remained constant since FY 1981. This indicates that Missouri is producing fewer graduates with advanced degrees in mathematics.

Mathematics Degrees Conferred by Higher Education Institutions in Missouri

Includes public and private higher education institutions.

DEGREE	FY81	FY96	FY97	FY98	FY99	FY00
Bachelors - Number	206	236	229	216	228	223
Bachelors - Percent of All Degrees	0.97%	0.91%	0.85%	0.78%	0.82%	0.78%
Masters - Number	88	54	39	45	52	40
Masters - Percent of All Degrees	1.21%	0.51%	0.36%	0.40%	0.43%	0.32%
Doctoral - Number	15	17	23	18	16	18
Doctoral - Percent of All Degrees	2.73%	2.47%	3.16%	2.31%	2.37%	2.48%

Source: MO Department of Higher Education.



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In FY 2000, a total of 1,691 post secondary degrees in engineering were conferred in Missouri, of which 69.3% were bachelors degrees, 26.4% were masters degrees and 4.3% were doctoral degrees. The number of bachelors degrees in engineering has decreased since FY 1981, as has engineering degrees as a percent of all bachelors degrees. This indicates that both numerically and proportionately fewer graduates are obtaining bachelors degrees in engineering in Missouri.

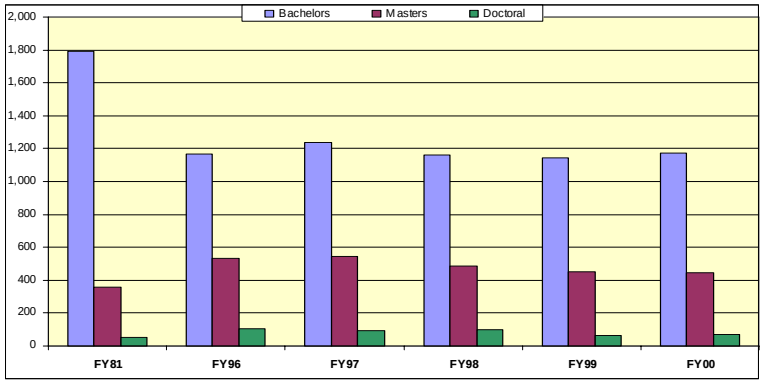
Since FY 1981, the number of masters degrees in engineering has increased, although there has been a decline since FY 1996. Additionally, engineering degrees as a percent of all masters degrees has also declined since FY 1981. In addition, the number and percent of doctoral degrees in engineering has declined since FY 1996, although the current figures are higher than in FY 1981. This indicates that Missouri is producing fewer graduates with advanced degrees in engineering.

Engineering Degrees Conferred by Higher Education Institutions in Missouri

Includes public and private higher education institutions.

DEGREE	FY81	FY96	FY97	FY98	FY99	FY00
Bachelors - Number	1,791	1,168	1,236	1,161	1,142	1,172
Bachelors - Percent of All Degrees	8.47%	4.49%	4.59%	4.20%	4.12%	4.09%
Masters - Number	357	534	545	488	451	447
Masters - Percent of All Degrees	4.92%	5.08%	5.02%	4.28%	3.72%	3.58%
Doctoral - Number	50	105	94	96	62	72
Doctoral - Percent of All Degrees	9.11%	15.24%	12.93%	12.32%	9.17%	9.92%

Source: MO Department of Higher Education.



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In FY 2000, a total of 1,165 post secondary degrees in computer science were conferred in Missouri, of which 85.6% were bachelors degrees, 13.6% were masters degrees and 0.8% were doctoral degrees. The number of bachelors degrees in computer science has increased since FY 1981, as has computer science degrees as a percent of all bachelors degrees. This indicates that both numerically and proportionately more graduates are obtaining bachelors degrees in computer science in Missouri.

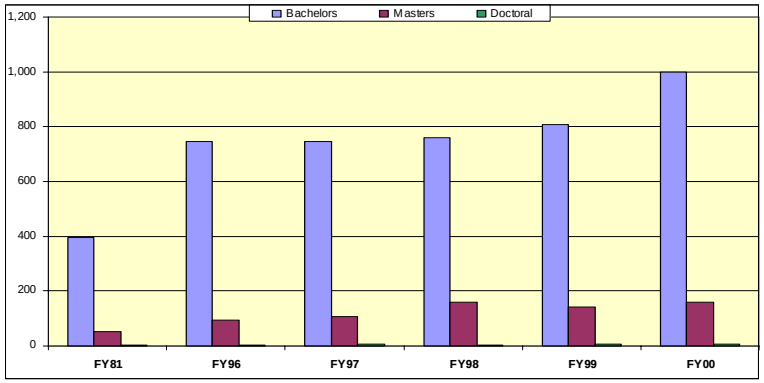
Since FY 1981, the number of masters degrees in computer science has increased, as has the computer science degrees as a percent of all masters degrees. In addition, the number and percent of doctoral degrees in computer science has grown since FY 1996, although the base numbers are quite small. This indicates that Missouri is producing more graduates with advanced degrees in computer science.

Computer Science Degrees Conferred by Higher Education Institutions in Missouri

Includes public and private higher education institutions.

DEGREE	FY81	FY96	FY97	FY98	FY99	FY00
Bachelors - Number	396	745	744	758	809	998
Bachelors - Percent of All Degrees	1.87%	2.86%	2.76%	2.74%	2.92%	3.48%
Masters - Number	53	92	109	160	142	159
Masters - Percent of All Degrees	0.73%	0.87%	1.00%	1.40%	1.17%	1.27%
Doctoral - Number	3	4	6	5	6	8
Doctoral - Percent of All Degrees	0.55%	0.58%	0.83%	0.64%	0.89%	1.10%

Source: MO Department of Higher Education.



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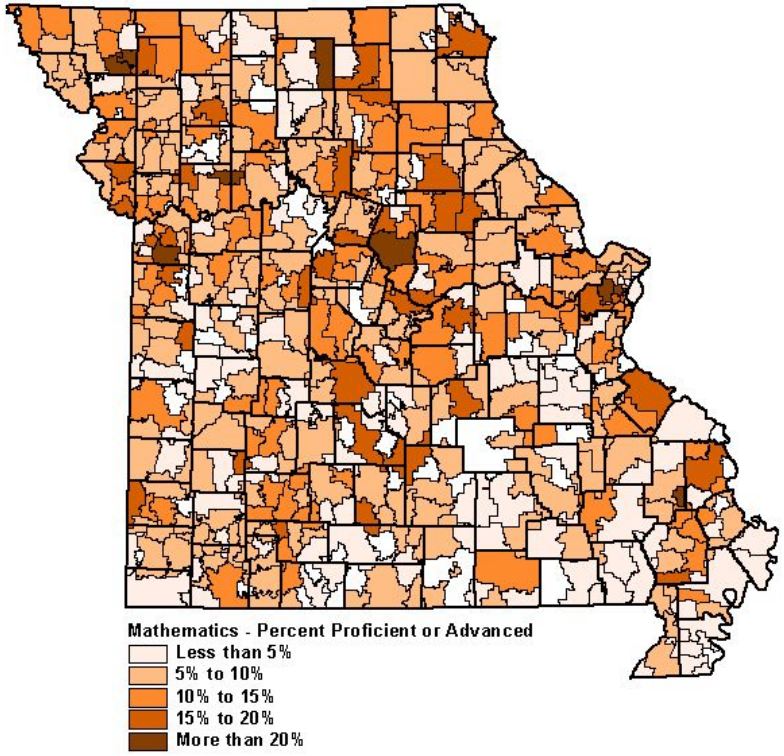
On average between 1997 and 2001, only 8.28% of Missouri's 10th graders were proficient or advanced in mathematics. Districts with the highest proficiencies were located in suburban St. Louis County, Columbia, suburban Kansas City and pockets of north central and northwest Missouri. In short, the majority of the state's districts scored low on mathematics proficiency.

These findings indicate that Missouri's K-12 student population is ill prepared for post secondary study in mathematics-related subjects, and ill prepared to enter the workforce immediately after high school into occupations that require mathematics skills.

Mathematics Missouri Assessment Program
Average Percent of 10th Grade Students Scoring Proficient or Advanced, 1997-2001



Source: Analysis of MO Department of Elementary and Secondary data by MERIC, MO Department of Economic Development.

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IV. Missouri's Top Mathematics-Intensive Occupations

Accountants and Auditors

Accountants and auditors help to ensure that firms are run more efficiently, its public records kept more accurately, and its taxes paid properly and on time. They perform these vital functions by offering an increasingly wide array of business and accounting services to their clients. These services include fiscal management, accounting and internal auditing.

Specific job duties vary widely among the four major fields of accounting. *Public accountants* perform a broad range of accounting, auditing, tax and consulting activities for their clients - who may be corporations, governments, nonprofit organizations or individuals. *Management accountants* - also called industrial, corporate or private accountants - record and analyze the financial information of the companies for which they work. Other responsibilities include budgeting, performance evaluation, cost management and asset management. *Government accountants* and *auditors* maintain and examine the records of government agencies and audit private businesses and individuals whose activities are subject to government regulations or taxation. *Internal auditors* verify the accuracy of their organization's records and check for mismanagement, waste or fraud. Specifically, they examine and evaluate their firms' financial and information systems, management procedures and internal controls to ensure that records are accurate and controls are adequate to protect against fraud and waste.

Most accountant and internal auditor positions require at least a bachelor's degree in accounting or a related field. Some employers prefer applicants with a master's degree in accounting or with a master's degree in business administration with a concentration in accounting. Professional recognition through certification or licensure provides a distinct advantage in the job market. All CPAs must have a certificate, and any partners in their firm must have licenses issued by a State Board of Accountancy. The vast majority of states require CPA candidates to be college graduates. In addition, 38 states currently require CPA candidates to complete an additional 30 hours beyond the usual 4-year bachelor's degree.

Job seekers who obtain professional recognition through certification or licensure, a master's degree, proficiency in accounting and auditing computer software, or specialized expertise will have an advantage in the job market. Competition will remain keen for the most prestigious jobs in major accounting and business firms.

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According to 2000 estimates, there were 17,320 Accountants in Missouri earning an annual mean wage of $44,390 per job, slightly below the national average of $48,090 per job. On average in Missouri, entry-level wages were $28,014 per job and experienced-level wages were $52,579 per job. Most Accountants and Auditors were employed in Services (8,050 jobs earning $48,022 per job), Public Administration (2,500 jobs earning $40,851 per job) and Finance, Insurance and Real Estate (2,040 jobs earning $41,700 per job).

In 2000, Accountants and Auditors in Missouri represented 2.01% of all jobs in this occupation nationally, earning 92.31% of the national mean annual wage. In the United States, employment for Accountants and Auditors is expected to grow by 18.5% between 2000 and 2010.

Accountants and Auditors
Employment and Wages by Industry in Missouri
Estimated annual average employment and wages for 2000. Numbers may not total due to rounding and survey averages.

INDUSTRY	AVERAGE EMPLOYMENT	ENTRY WAGE	MEAN WAGE	EXPERT WAGE
Agriculture, Forestry and Fishing	10	$20,504	$32,738	$38,854
Mining	30	$36,526	$42,391	$45,324
Construction	700	$27,684	$35,452	$39,336
Manufacturing	1,900	$29,439	$45,439	$53,439
Transportation and Public Utilities	850	$27,562	$41,366	$48,268
Wholesale Trade	830	$26,066	$39,159	$45,706
Retail Trade	430	$25,368	$36,031	$41,363
Finance, Insurance, and Real Estate	2,040	$27,000	$41,700	$49,049
Services	8,050	$28,852	$48,022	$57,606
Public Administration	2,500	$28,242	$40,851	$47,156
MISSOURI TOTAL	**17,320**	**$28,014**	**$44,390**	**$52,579**
UNITED STATES TOTAL	**863,320**	**$34,290**	**$48,090**	**$56,190**

Source: Analysis of Occupational Employment Statistics and O*NET by MERIC, MO Department of Economic Development.

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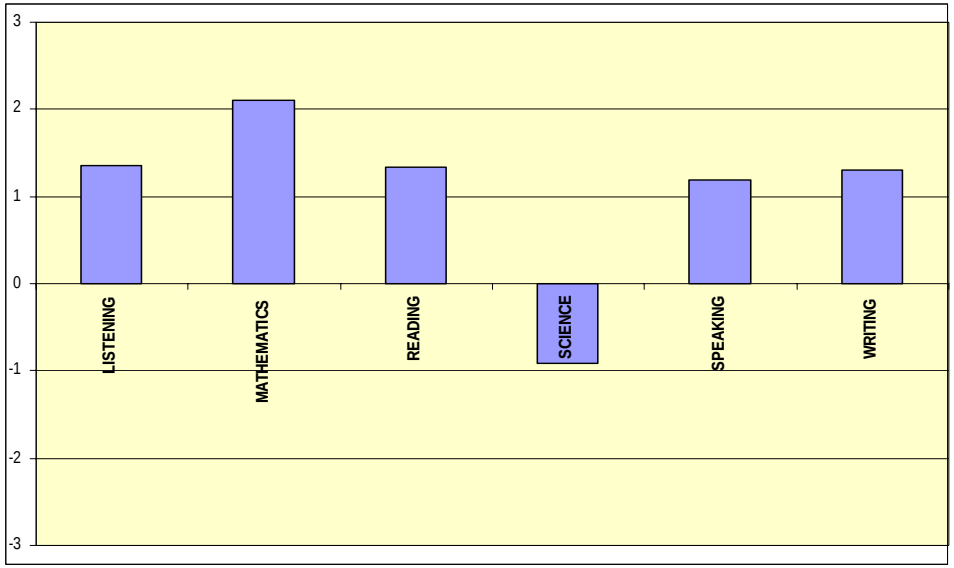
Accountants and Auditors require high proficiency in mathematics skills (2.0 or more standard deviations above the mean). In addition, above average proficiency in listening, reading, writing and speaking skills are generally needed for this occupation (1.0 or more standard deviation above the mean). Most people in this occupation possess below average science skills. This indicates that above average abilities in a wide array of skills - with specialization in mathematics - is essential for success as an Accountant or Auditor.

Accountants and Auditors
Skills Proficiency
Skills reported in standard deviations above the mean for all occupations.
Scores of 0.0 indicate mean skill level for all occupations.

LISTENING SKILLS	MATHEMATICS SKILLS	READING SKILLS	SCIENCE SKILLS	SPEAKING SKILLS	WRITING SKILLS
1.3499	2.1012	1.3448	-0.9144	1.187	1.3007

Source: Analysis of O*NET by MERIC, MO Department of Economic Development.



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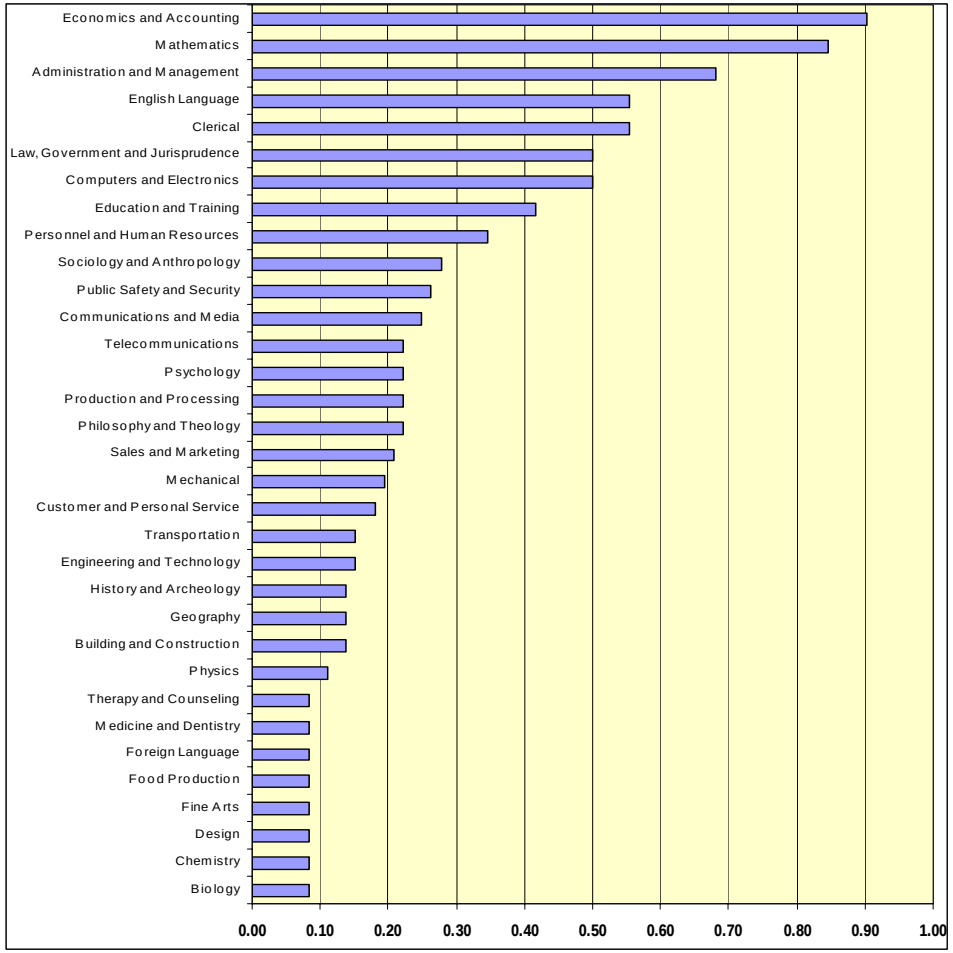
Economics and Accounting (proficiency score of 0.90) and Mathematics (proficiency score of 0.85) are the most important knowledge domains needed for Accountants and Auditors.

Accountants and Auditors
Knowledge Domain Proficiency
Skills proficiency reported on a 0.0 (low) to 1.0 (high) scale.



Source: Analysis of O*NET by MERIC, MO Department of Economic Development.

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Computer Software Engineers

The explosive impact of computers and information technology on our everyday lives has generated a need to design and develop new computer software systems and to incorporate new technologies in a rapidly growing range of applications. Computer software applications engineers analyze users' needs and design, create and modify general computer applications software or specialized utility programs. Different programming languages are used, depending on the purpose of the program. Some software engineers develop both packaged systems and systems software or create customized applications.

Most employers prefer to hire persons who have at least a bachelor's degree and broad knowledge and experience with computer systems and technologies. Graduate degrees are preferred for some of the more complex jobs. Computer software engineers must continually strive to acquire new skills as computer technology changes rapidly. As technological advances in the computer field continue, employers demand new skills. Computer software engineers must continually strive to acquire new skills if they wish to remain in this extremely dynamic field. To help them keep up with the changing technology, continuing education and professional development seminars are offered by employers and software vendors, colleges and universities, private training institutions, and professional computing societies.

Computer software engineers are projected to be the fastest growing occupation over the 2000-2010 period. Very favorable opportunities are expected for college graduates with at least a bachelor's degree in computer engineering or computer science and practical experience working with computers.

A increasing number of computer software engineers are employed on a temporary or contract basis - many of whom are self-employed that work independently as consultants. Some consultants work for firms that specialize in developing and maintaining client companies' websites and intranets. Consulting opportunities for software engineers should grow as businesses need help managing, upgrading and customizing increasingly complex computer systems. Nationally, about 49,000 computer software and systems engineers were self-employed in 2000.

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According to 2000 estimates, there were 5,950 Computer Software Engineers in Missouri earning an annual mean wage of $65,182 per job, below the national average of $70,300 per job. On average in Missouri, entry-level wages were $47,749 per job and experienced-level wages were $73,898 per job. Most were employed in Services (3,630 jobs earning $66,046 per job), Transportation and Public Utilities (1,270 jobs earning $66,438 per job) and Finance, Insurance and Real Estate (580 jobs earning $62,463 per job).

In 2000, Computer Software Engineers in Missouri represented 1.59% of all jobs in this occupation nationally, earning 92.72% of the national mean annual wage. In the United States, employment for Computer Software Engineers is expected to grow by an astounding 100.0% between 2000 and 2010.

Computer Software Engineers
Employment and Wages by Industry in Missouri
Estimated annual average employment and wages for 2000. Numbers may not total due to rounding and survey averages.

INDUSTRY	AVERAGE EMPLOYMENT	ENTRY WAGE	MEAN WAGE	EXPERT WAGE
Agriculture, Forestry and Fishing	0	0	0	0
Mining	0	0	0	0
Construction	10	$39,584	$61,184	$71,984
Manufacturing	350	$41,159	$55,143	$62,135
Transportation and Public Utilities	1,270	$53,451	$66,438	$72,932
Wholesale Trade	80	$48,153	$68,783	$79,098
Retail Trade	10	$39,584	$78,800	$98,407
Finance, Insurance, and Real Estate	580	$42,389	$62,463	$72,500
Services	3,630	$48,426	$66,046	$74,856
Public Administration	10	$48,523	$57,236	$61,592
MISSOURI TOTAL	**5,950**	**$47,749**	**$65,182**	**$73,898**
UNITED STATES TOTAL	**374,640**	**$53,390**	**$70,300**	**$85,490**

Source: Analysis of Occupational Employment Statistics and O*NET by MERIC, MO Department of Economic Development.

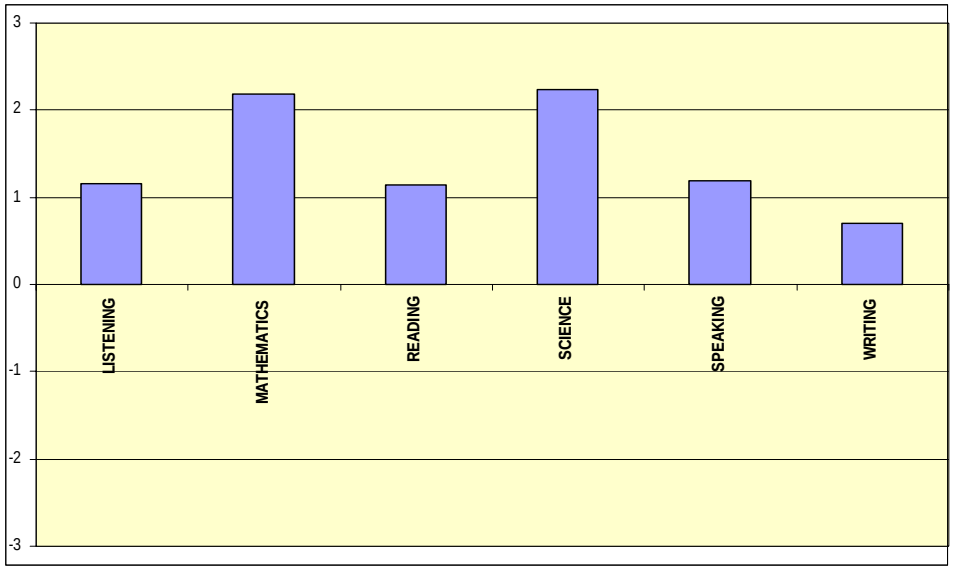
Computer Software Engineers require high proficiency in science and mathematics skills (2.0 or more standard deviations above the mean). In addition, above average proficiency in speaking, listening and reading skills are generally needed for this occupation (1.0 or more standard deviation above the mean). This indicates that above average abilities in a wide array of skills - with specialization in science and mathematics - is essential for success as a Computer Software Engineer.

Computer Software Engineers
Skills Proficiency

Skills reported in standard deviations above the mean for all occupations.
Scores of 0.0 indicate mean skill level for all occupations.

LISTENING SKILLS	MATHEMATICS SKILLS	READING SKILLS	SCIENCE SKILLS	SPEAKING SKILLS	WRITING SKILLS
1.1553	2.1833	1.1485	2.2375	1.187	0.7056

Source: Analysis of O*NET by MERIC, MO Department of Economic Development.



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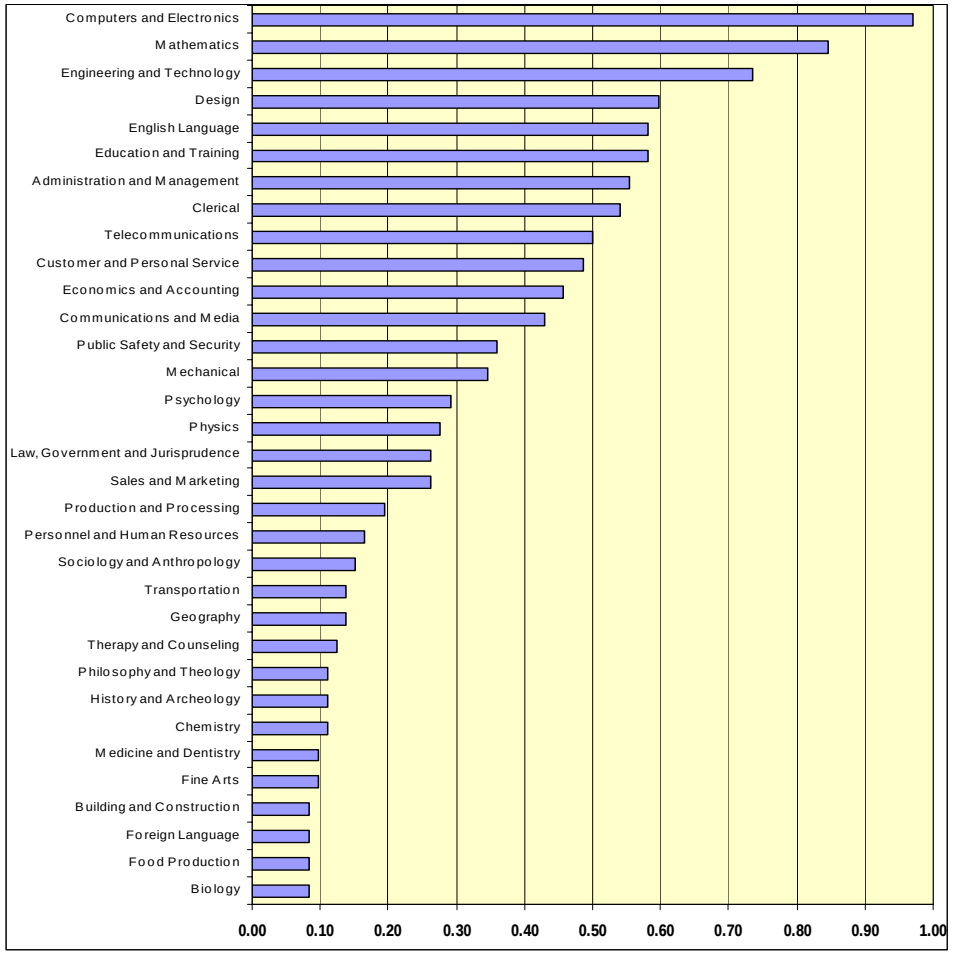
Computers and Electronics (proficiency score of 0.97), Mathematics (proficiency score of 0.85) and Engineering and Technology (proficiency score of 0.74) are the most important knowledge domains needed for Computer Software Engineers.

Computer Software Engineers
Knowledge Domain Proficiency
Skills proficiency reported on a 0.0 (low) to 1.0 (high) scale.



Source: Analysis of O*NET by MERIC, MO Department of Economic Development.

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Computer Systems Engineers

The explosive impact of computers and information technology on our everyday lives has generated a need to design and develop new computer systems and to incorporate new technologies in a rapidly growing range of applications. Computer systems engineers coordinate the construction and maintenance of a company's computer systems, and plan their future growth. They coordinate each department's computer needs and make suggestions about its technical direction. They also might set up the company's intranets, which are networks that link computers within the organization and ease communication.

Most employers prefer to hire persons who have at least a bachelor's degree and broad knowledge and experience with computer systems and technologies. Graduate degrees are preferred for some of the more complex jobs. Computer systems engineers must continually strive to acquire new skills as computer technology changes rapidly. As technological advances in the computer field continue, employers demand new skills. Computer systems engineers must continually strive to acquire new skills if they wish to remain in this extremely dynamic field. To help them keep up with the changing technology, continuing education and professional development seminars are offered by employers and software vendors, colleges and universities, private training institutions, and professional computing societies.

Computer systems engineers are projected to be the fastest growing occupation over the 2000-2010 period. Very favorable opportunities are expected for college graduates with at least a bachelor's degree in computer engineering or computer science and practical experience working with computers.

A increasing number of computer systems engineers are employed on a temporary or contract basis - many of whom are self-employed, that work independently as consultants. Some consultants work for firms that specialize in developing and maintaining client companies' websites and intranets. Consulting opportunities for systems engineers should grow as businesses need help managing, upgrading and customizing increasingly complex computer systems. Nationally, about 49,000 computer software and systems engineers were self-employed in 2000.

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According to 2000 estimates, there were 3,700 Computer Systems Engineers in Missouri earning an annual mean wage of $64,743 per job, well below the national average of $70,890 per job. On average in Missouri, entry-level wages were $44,464 per job and experienced-level wages were $74,882 per job. Most were employed in Services (2,140 jobs earning $66,281 per job), Manufacturing (930 jobs earning $61,533 per job) and Finance, Insurance and Real Estate (440 jobs earning $61,552 per job).

In 2000, Computer Systems Engineers in Missouri represented 1.40% of all jobs in this occupation nationally, earning 91.33% of the national mean annual wage. In the United States, employment for Computer Systems Engineers is expected to grow by 89.7% between 2000 and 2010.

Computer Systems Engineers
Employment and Wages by Industry in Missouri
Estimated annual average employment and wages for 2000. Numbers may not total due to rounding and survey averages.

INDUSTRY	AVERAGE EMPLOYMENT	ENTRY WAGE	MEAN WAGE	EXPERT WAGE
Agriculture, Forestry and Fishing	0	0	0	0
Mining	0	0	0	0
Construction	0	0	0	0
Manufacturing	930	$48,114	$61,533	$68,243
Transportation and Public Utilities	120	$56,065	$69,170	$75,722
Wholesale Trade	40	$48,102	$71,211	$82,765
Retail Trade	30	$44,318	$75,848	$91,613
Finance, Insurance, and Real Estate	440	$46,163	$61,552	$69,247
Services	2,140	$42,298	$66,281	$78,273
Public Administration	0	0	0	0
MISSOURI TOTAL	**3,700**	**$44,464**	**$64,743**	**$74,882**
UNITED STATES TOTAL	**264,610**	**$54,460**	**$70,890**	**$86,520**

Source: Analysis of Occupational Employment Statistics and O*NET by MERIC, MO Department of Economic Development.

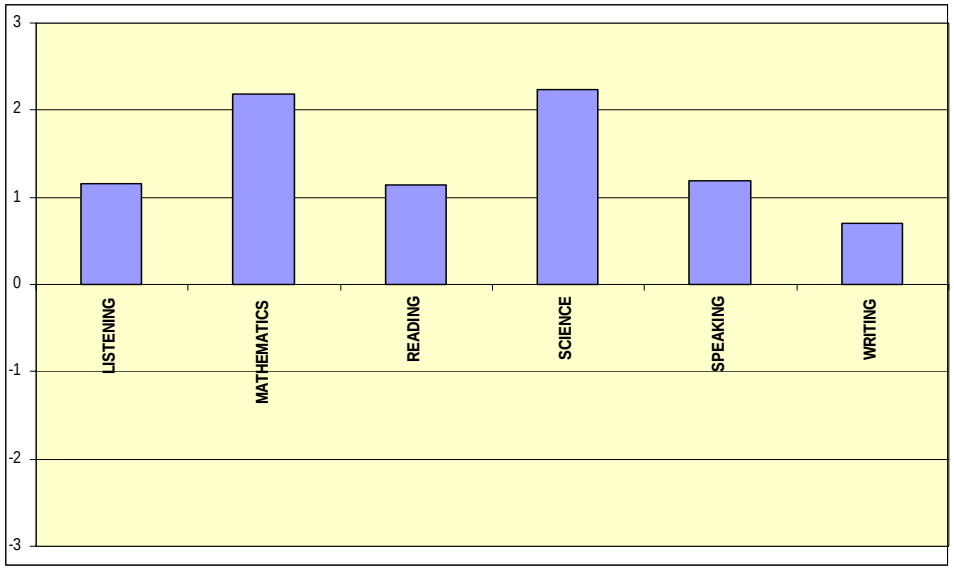
Computer Systems Engineers require high proficiency in science and mathematics skills (2.0 or more standard deviations above the mean). In addition, above average proficiency in speaking, listening and reading skills are generally needed for this occupation (1.0 or more standard deviation above the mean). This indicates that above average abilities in a wide array of skills - with specialization in science and mathematics - is essential for success as a Computer Systems Engineer.

Computer Systems Engineers
Skills Proficiency

Skills reported in standard deviations above the mean for all occupations.
Scores of 0.0 indicate mean skill level for all occupations.

LISTENING SKILLS	MATHEMATICS SKILLS	READING SKILLS	SCIENCE SKILLS	SPEAKING SKILLS	WRITING SKILLS
1.1553	2.1833	1.1485	2.2375	1.187	0.7056

Source: Analysis of O*NET by MERIC, MO Department of Economic Development.



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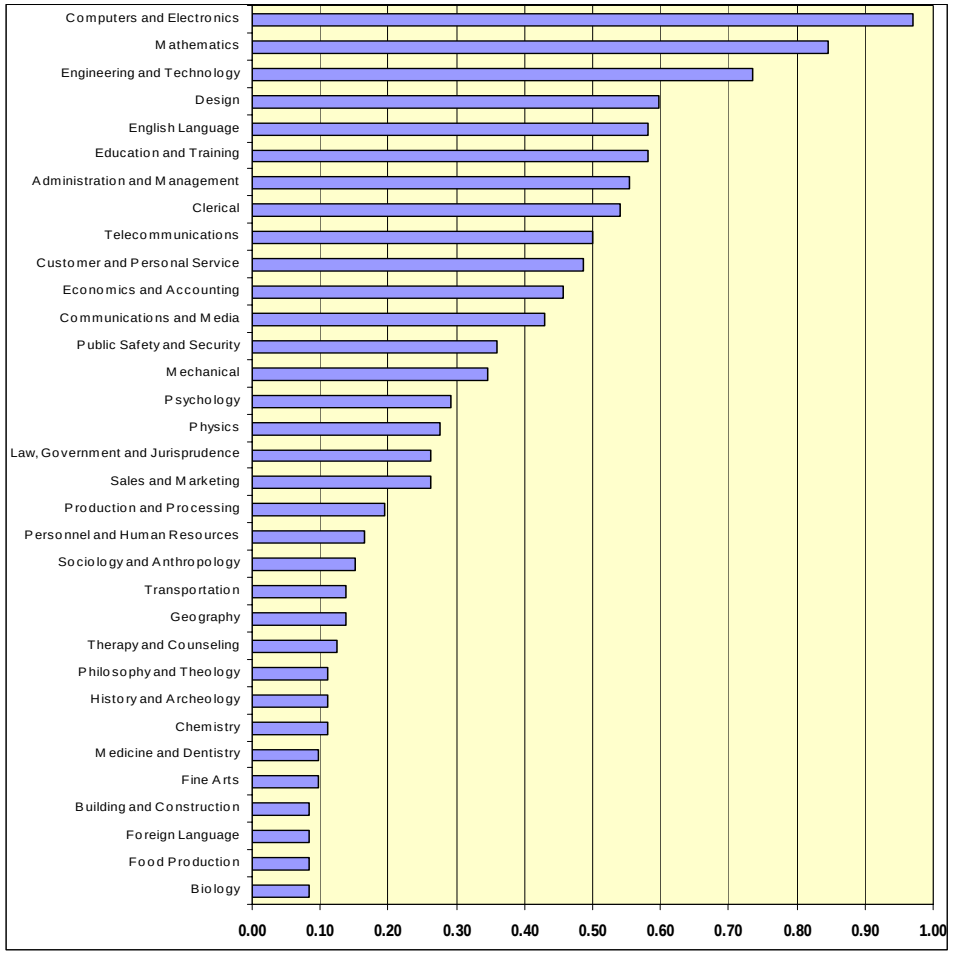
Computers and Electronics (proficiency score of 0.97), Mathematics (proficiency score of 0.85) and Engineering and Technology (proficiency score of 0.74) are the most important knowledge domains needed for Computer Systems Engineers.

Computer Systems Engineers
Knowledge Domain Proficiency
Skills proficiency reported on a 0.0 (low) to 1.0 (high) scale.



Source: Analysis of O*NET by MERIC, MO Department of Economic Development.

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Civil Engineers

Civil engineers design and supervise the construction of roads, buildings, airports, tunnels, dams, bridges, and water supply and sewage systems. Many civil engineers hold supervisory or administrative positions, from supervisor of a construction site to city engineer. Others may work in design, construction, research and teaching. In the coming years, civil engineers will also be needed to repair or replace existing roads, bridges and other public structures. There may be additional opportunities within non-civil engineering firms, such as management consulting or computer services firms. In addition to job growth, openings will result from the need to replace civil engineers that transfer to other occupations or leave the labor force.

A bachelor's degree in engineering is required for almost all entry-level engineering jobs. College graduates with a degree in a physical science or mathematics occasionally may qualify for some engineering jobs, especially in specialties in high demand. Most engineering degrees are granted in electrical, mechanical or civil engineering. However, engineers trained in one branch may work in related branches.

Employment of civil engineers is expected to increase about as fast as the average for all occupations through 2010. Spurred by general population growth and an expanding economy, more civil engineers will be needed to design and construct higher capacity transportation, water supply, pollution control systems and large buildings and building complexes. Because construction and related growth industries employ many civil engineers, employment opportunities will vary by geographic area depending on economic and population growth. Conversely, employment opportunities may decrease during economic slowdowns or population declines.

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According to 2000 estimates, there were 3,140 Civil Engineers in Missouri earning an annual mean wage of $55,866 per job, slightly less than the national average of $58,380 per job. On average in Missouri, entry-level wages were $40,065 per job and experienced-level wages were $63,766 per job. Most Civil Engineers were employed in Services (1,710 jobs earning $53,717 per job), Public Administration (820 jobs earning $57,229 per job) and Construction (300 jobs earning $56,203 per job).

In 2000, Civil Engineers in Missouri represented 1.52% of all jobs in this occupation nationally, earning 95.69% of the national mean annual wage. In the United States, employment for Civil Engineers is expected to grow by 10.2% between 2000 and 2010.

Civil Engineers
Employment and Wages by Industry in Missouri
Estimated annual average employment and wages for 2000. Numbers may not total due to rounding and survey averages.

INDUSTRY	AVERAGE EMPLOYMENT	ENTRY WAGE	MEAN WAGE	EXPERT WAGE
Agriculture, Forestry and Fishing	0	0	0	0
Mining	0	0	0	0
Construction	300	$40,112	$56,203	$64,249
Manufacturing	60	$38,226	$48,197	$53,183
Transportation and Public Utilities	230	$58,875	$65,645	$69,030
Wholesale Trade	0	0	0	0
Retail Trade	0	0	0	0
Finance, Insurance, and Real Estate	20	$50,743	$84,114	$100,800
Services	1,710	$36,232	$53,717	$62,460
Public Administration	820	$46,385	$57,229	$62,650
MISSOURI TOTAL	**3,140**	**$40,065**	**$55,866**	**$63,766**
UNITED STATES TOTAL	**207,080**	**$45,150**	**$58,380**	**$69,470**

Source: Analysis of Occupational Employment Statistics and O*NET by MERIC, MO Department of Economic Development.

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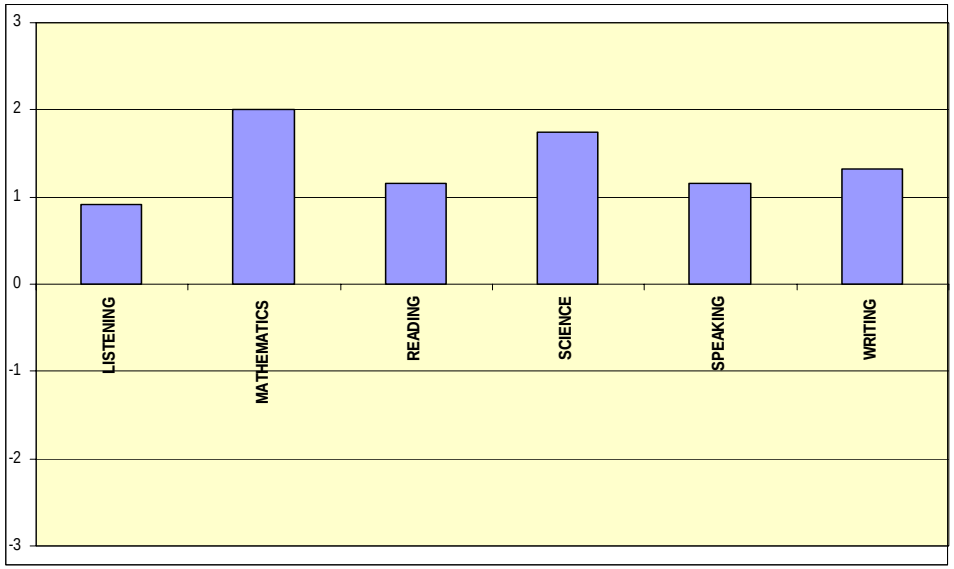
Civil Engineers require high proficiency in mathematics skills (2.0 or more standard deviations above the mean). In addition, above average proficiency in science, writing, speaking and reading skills are generally needed for this occupation (1.0 or more standard deviation above the mean). This indicates that above average abilities in a wide array of skills - with specialization in mathematics - is essential for success as a Civil Engineer.

Civil Engineers
Skills Proficiency

Skills reported in standard deviations above the mean for all occupations.
Scores of 0.0 indicate mean skill level for all occupations.

LISTENING SKILLS	MATHEMATICS SKILLS	READING SKILLS	SCIENCE SKILLS	SPEAKING SKILLS	WRITING SKILLS
0.9068	2.0042	1.1532	1.7463	1.1621	1.3238

Source: Analysis of O*NET by MERIC, MO Department of Economic Development.



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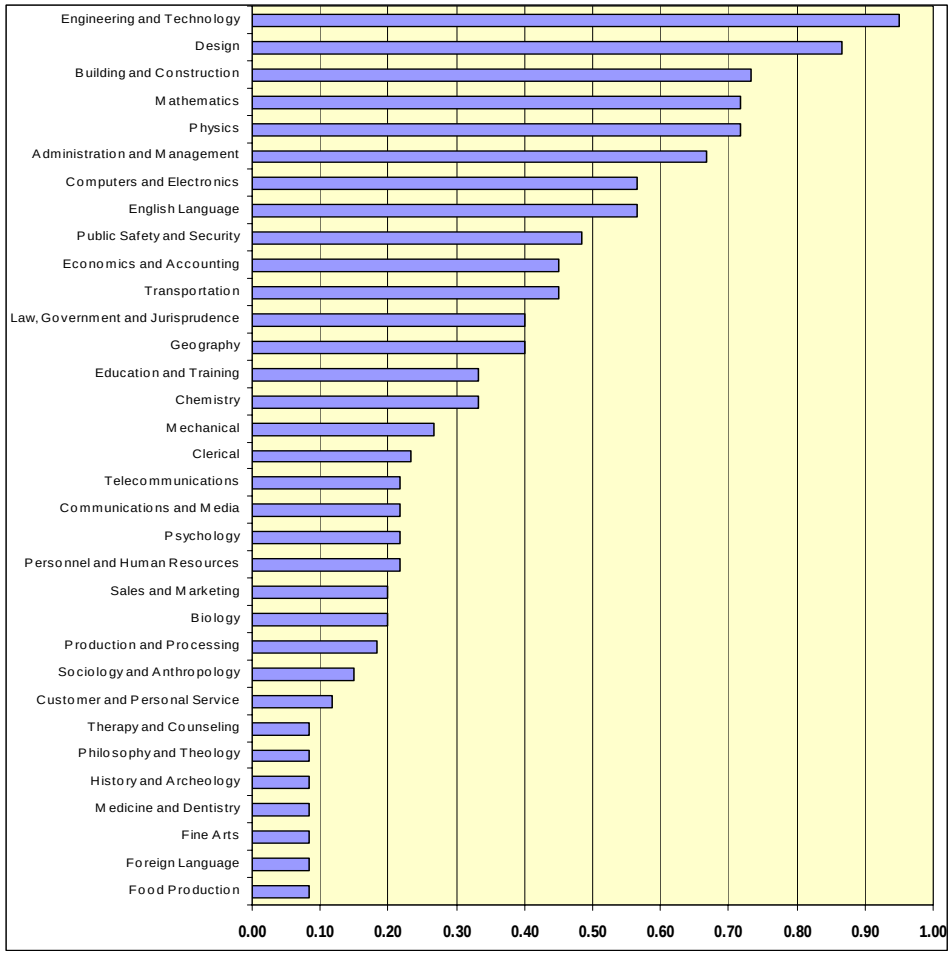
Engineering and Technology (proficiency score of 0.95), Design (proficiency score of 0.87), Building and Construction (proficiency score of 0.73), Mathematics (proficiency score of 0.72) and Physics (proficiency score of 0.72) are the most important knowledge domain needed for Civil Engineers.

Civil Engineers
Knowledge Domain Proficiency
Skills proficiency reported on a 0.0 (low) to 1.0 (high) scale.



Source: Analysis of O*NET by MERIC, MO Department of Economic Development.

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V. Implications and Summary

Mathematics is one of the key knowledge bases in today's economy. Therefore, this analysis focuses on those occupations that require a high degree of knowledge in mathematics - a targeted Gateway Skill. According to 2000 estimates, there were 50,890 mathematics-intensive jobs in Missouri earning an annual mean wage of $53,193 per job, which is much higher than the state average wage of $30,812 per job. Nationally, there were 2.94 million mathematics-intensive jobs earning an annual mean wage of $58,886 per job. Missouri employs 1.73% of this national total at 90.3% of the national mean annual wage, indicating lower labor costs for mathematics-intensive jobs.

In Missouri, most mathematics-intensive jobs were in Services, Manufacturing, Finance, Insurance and Real Estate, Public Administration and Transport and Public Utilities. Mathematics-intensive occupations with the highest employment base were Accountants and Auditors, Computer Software Engineers, Computer Systems Engineers, Aerospace Engineers and Civil Engineers.

Occupations with the largest percentage of national employment in Missouri were Agricultural Engineers (5.07% of national employment at 97.04% of national mean wages), Aerospace Engineers (4.65% of national employment at 81.43% of national mean wages) and Higher Education Engineering Teachers (3.64% of national employment at 100.62% of national mean wages). These occupations can be considered target occupations, since Missouri has a fair share of national employment and state wage rates are at or below the national mean annual wage - indicating lower labor costs, a possible competitive advantage.

As expected, Mathematics is the most important knowledge domain needed for mathematics-intensive occupations. Other relevant knowledge domains include Engineering and Technology and Computers and Electronics. Missouri institutions of higher education are producing fewer college graduates in many of these fields of study than they did 20 years ago. The number of graduates obtaining any post secondary degree (bachelors, masters or doctorate) in mathematics and engineering has declined over the past 20 years. More worrisome, however, is that only 8.28% of Missouri's 10th graders were proficient or advanced in mathematics. This indicates that Missouri's K-12 student population is ill prepared for post secondary study in mathematics-related subjects, and ill prepared to enter the workforce immediately after high school into occupations that require mathematics skills.

In conclusion, mathematics-intensive occupations are an important part of Missouri's growing economy. Development of these occupations will be essential for Missouri to remain competitive in the global economy of the 21st century. To achieve this, both private and public partners need to strengthen mathematics-intensive occupations through business development, improved K-12 mathematics education and expanded higher education programs in mathematics and science.

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